

**Amendments to the Drawings:**

The attached sheet of drawings includes changes to Fig.11 and Fig. 13.

Original sheet 15 is replaced with Replacement Sheet 15, which includes Fig 11. Original sheet 17 is replaced with Replacement Sheet 17, which includes Fig 13.

The Replacement sheets have no new subject matter, but have been provided, at the Examiner's request, to provide more clear copies of electron micrographs. No new elements have been added.

## **REMARKS/ARGUMENTS**

### **The Specification**

The Action states that priority has not been granted for the claimed method. However, Applicants believe the priority claim of the application is correct and appropriate. For example, original claim 87 appears to be fully supported by the original Provisional application 60/501,158, filed September 8, 2003. Applicants note that the currently amended claim 87 is supported by priority claim ed at least back to application 60/549,712, filed March 2, 2004. Therefore, Applicants respectfully request recognition of these documented filings.

The Action alleged informalities in the alternate representation of certain metal compositions. For example, the formulation  $\text{Co}_{0.88}\text{Mo}_{1.2}$  is alleged to be informal. However, formulations of this type are standard and well understood in the field. One in the field knows that this formulation represents 88% Co and 12% Mo.  $\text{Co}_{0.88}\text{Mo}_{1.2}$  could be also alternately expressed, e.g., as  $\text{Co}_{0.88}\text{Mo}_{0.12}$  or as  $\text{Co}_{88}\text{Mo}_{12}$ . Proportions of formulation constituents can be written in a variety of ways understood in the art. However, the fact that the formula could be expressed in any number of ways does not make the expression  $\text{Co}_{0.88}\text{Mo}_{1.2}$  informal or in error. Therefore, Applicants respectfully decline to change this and similar expressions in the specification.

### **Election/Restriction Requirement**

Pursuant to a restriction requirement made final, Applicants cancel claims 1-86 and 113-119, with entry of this amendment. Please note, however, that Applicants reserve the right to file subsequent applications claiming the canceled subject matter and the claim cancellations should not be construed as abandonment or agreement with the Examiner's position in the Office Action.

Applicants have elected Group IV, claims 87-112. Applicants have elected species within these claims for current consideration:

Nanoparticles -	Carbon nanotubes
Fiber -	Porous electrode
Catalyst -	$\text{Co}_{1-x}\text{Mo}_x$ , where $0 \leq x \leq 0.3$
Film -	Platinum alloy

The Examiner has requested a listing of all claims wherein these species elections apply. In response to this request, Applicants agree with the Examiner that the elected species appear to read on claims 87 and 91-112 (claims 88 to 90 being directed exclusively to a plurality carbon fibers instead of the currently elected porous electrodes).

#### **The Status of the Claims.**

Claims 87-92, 94-112, are pending with entry of this amendment, claims 1-86, 93 and 113-119 being cancelled herein. Claims 87, 96, 96, 101-103, 106 and 107 are amended herein. These amendments introduce no new matter and support is replete throughout the specification. These amendments are made without prejudice and are not to be construed as abandonment of the previously claimed subject matter or agreement with any objection or rejection of record.

With respect to claim 87, the amendment merely incorporates the limitations of cancelled claim 93 without importation of additional limitations to the claim set.

With regard to claims 96, 97, 101, 102, 103, 106 and 107, the amendments merely remove one or more terms ("about"), without addition of subject matter. The addition of the term "6%" to claim 106 is supported, e.g., in paragraphs 15, 17 and 58.

Applicants submit that no new matter has been added to the application by way of the above Amendment. Accordingly, entry of the Amendment is respectfully requested.

#### **The Drawings.**

Applicants have provided Figures 11 and 13 comprising electron micrographs. The original copies provide adequate detail to compliment the discussion in the text and are not necessary to the understanding of the presently claimed inventions. However, in the interest of cooperation, Applicants have provided (attached) replacement Figures with somewhat improved resolution and printing quality. In any case, both the original and

replacement Figures can clearly be recognized for what they are and what they are described as in the original specification. Applicants respectfully request acceptance of the Replacement Figures.

**The Information Disclosure Statement.**

Applicants note with appreciation the Examiner's thorough consideration of the references cited in the Information Disclosure Statement (Form 1449) submitted on February 9, 2006.

**35 U.S.C. §112, Second Paragraph.**

Claim 87-112 were rejected under 35 U.S.C. §112, second paragraph, for the alleged indefiniteness of the term "Nanoparticle". However, the term is not indefinite because it is a well known term in a well established art. Moreover nanoparticles are clearly defined in the present specification and thus, not subject to such a rejection (see MPEP 2173.02). For example, see the definition of nanoparticle provided in paragraph 25 of the original specification. Because the term is well known and clearly defined, the rejection should be withdrawn.

Claims 94 and 95 were rejected as allegedly indefinite. Dependent claim 94 describes certain catalysts in the formula format, e.g.,  $\text{Co}_{1-x}\text{Mo}_x$ . Separately, dependent claim 95 describes certain catalysts using a formula format, e.g.,  $\text{Co}_{8.8}\text{Mo}_{1.2}$ . The rationale cited in the Action for rejection is that "values in claim 95 are inconsistent with the ranges defined in claim 94." However, this is not a basis for such a rejection. Separate dependent claims are not required to express similar concepts in exactly the same way. Neither claim is dependent on the other, so there can be no confusion caused by antecedent basis issues. Finally, although not required, the ranges of catalyst formulations in the claims are in fact consistent, contrary to the statement in the Action. For example, the claim 95 Markush member  $\text{Co}_{8.8}\text{Mo}_{1.2}$  is known in the art, and consistently described in the present specification, as describing a composition of 88% Co and 12% Mo. This is in the range of the claim 94 Markush member  $\text{Co}_{1-x}\text{Mo}_x$  where  $0 \leq x \leq 0.3$  (i.e.,  $x=0.12$ ,  $\text{Co}_{1-0.12}\text{Mo}_{1.2}$ , or the equivalent formulas:  $\text{Co}_{8.8}\text{Mo}_{1.2}$ ,  $\text{Co}_{0.88}\text{Mo}_{0.12}$ , or Co 88% Mo 12%, etc.) Because consistency between these dependent claims is not required and because the formulas are objectively defined

terms, there is no basis for an allegation of indefiniteness. Applicants respectfully request this rejection be withdrawn.

Claims 97, 101-103 and 106-107 were rejected for the alleged definiteness of the term "about". Applicants do not agree that the term is unreasonably indefinite in the context of the claims and specification. However, in the spirit of cooperation, the term has been amended out of the claims and the rejection is therefore moot. Applicants request withdrawal of the rejection.

**35 U.S.C. §112, First Paragraph.**

Claims 106 and 107 were rejected under 35 U.S.C. §112, first paragraph, based on the allegation that the specification does "not reasonably provide enablement of [Pt] values less than 0.06." However, with the current amendment to claim 106, excluding alloys in this case less than 6%, the point is rendered moot.

**35 U.S.C. §103(a).**

Claims 87, 91-108, and 112 were rejected under 35 U.S.C. §103(a) as allegedly obvious in based on Yan (U.S. 2004/0167014) and Luczak (U.S. 4,447,506) in light of a variety of secondary references. Applicants traverse.

Three requirements must be met for a *prima facie* case of obviousness. First, the prior art reference must teach all of the limitations of the claims. M.P.E.P. § 2143.03. Second, there must be a motivation to modify the reference or combine the teachings to produce the claimed invention. M.P.E.P. § 2143.01. Third, a reasonable expectation of success is required. M.P.E.P. § 2143.02. The teaching or suggestion to combine and the expectation of success must be both found in the prior art and not based on Applicants' disclosure. M.P.E.P. §2143. Specifically, a *prima facie* case of obviousness requires that the combination of the cited art, taken with the general knowledge in the field, must provide all of the elements of the claimed invention. When a rejection depends on a combination of prior art references, there must be some teaching, suggestion or motivation to combine the references. In re Geiger, 815 USPQ2s 1276, 1278 (Fed. Cir. 1987). Moreover, to support an obviousness rejection the cited references must additionally provide a reasonable expectation

of success. In re Vaeck, 20 USPQ2d 1438 (Fed. Cir. 1991), citing In re Dow Chemical Co., 5 USPQ2d 1529, 1531 (Fed. Cir. 1988).

At the outset, Applicants want to make it clear that the present invention discloses two types of catalysts: 1) catalysts catalyzing formation of nanoparticles, e.g., during a chemical vapor deposition, and 2) catalytically active layers useful in fuel cells for generation of electric current, e.g., catalyzing reactions forming water from hydrogen and oxygen. Confusion between these distinctly different catalysts must be avoided in analysis of the present claims.

**Claims are not obvious based on Yan and Luczak.** Claims 87, 91-94, 98-99 and 104-107 were rejected as allegedly obvious in view of Yan and Luczak. Yan teaches formation of an electrode by electroplating Co onto carbon paper, followed by nanotube growth on the Co catalyst, and electrodeposition of Pt onto the nanotubes. Luczak teaches electroplating Pt onto carbon black supports followed by adsorption of, e.g., chromium and cobalt salts onto the PT before heat treatment to form an alloy coated carbon black fuel cell electrode. The cited combination does not render the present claims obvious because it does not teach all limitations of the claims, the combination is unmotivated and there would not be an expectation of success in the combination.

As a preliminary matter, Applicants believe Yan, published August 26, 2004, is not qualified as a reference with regard to section 103 obviousness allegations in this case. At least the present independent claim 87 is supported by a priority claim in this case going back at least to provisional application 60/549,712, filed March 2, 2004. Therefore, Applicants respectfully request any obviousness rejections based on Yan be withdrawn.

Assuming for argument that Yan were qualified as an obviousness reference in this case, the combination of Yan and Luczak still fails to provide all limitations of claim 87. For example, the limitations of claim 93 (also rejected based on Yan and Luczak) - depositing nanotube growth "catalyst on said fibers by chemical vapor deposition (CVD)" has been incorporated into claim 87 by amendment. In the Action, bottom of page 9, the abstract of Yan is cited as teaching the limitations of depositing a nanoparticle catalyst on fibers by chemical vapor deposition (CVD). However, Yan and the cited abstract teach a method of CVD carbon nanotube deposition onto a catalyst, not the CVD deposition of a catalyst onto a

fiber. This rejection fails the test of "suitability for its intended use" of *Sinclair & Carroll Co. v. Interchemical Corp.*, cited in the Action. Therefore this combination further fails to teach the present invention. Because the cited combination does not teach all limitations of the claims, the rejection of claim 87, and all associated dependent claims, must be withdrawn.

Again assuming Yan were a qualified reference, the present claims are still unobvious because the combination cited in the rejection is not motivated. There is no suggestion in the references for such a combination; in fact, the references materially teach away from each other (e.g., in suggested incompatible substrates and coating technologies). Thus, the claims are non-obvious according to *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997). Luczak directly coats the electrode support substrate with fuel cell catalyst alloys. If one were to modify the electrode of Yan, as the rejection suggests, to include direct deposit of fuel cell catalysts onto the fibers instead of growing nanotubes, the claimed benefits of Yan would be lost. The result would be unsatisfactory result and would not be expected to succeed. Therefore, such a combination would be non-obvious according to both *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984) and *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Additionally, the combination would be non-obvious based on *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) for changing the principle of operation of Yan from fuel cell catalysis on the surface of nanotubes with conduction on a substrate to the Luczak principle of coating and catalysis directly on the conductive substrate.

Because the independent claim 87 is not obvious in view of the combination for failure to teach all limitations, failure to motivate the claimed invention or to provide an expectation of success, the rejection under section 103 should be withdrawn. Moreover, because dependent claims include the limitations of the claims upon which they depend, neither can they be considered obvious.

**Claims are not obvious based on Yan and Luczak in view of Harris.** Claims 99-103 and 112 were rejected as allegedly obvious based on Yan and Luczak in light of Harris (U.S. 4,395,322). Again, because Yan was published after the effective priority date of the present

application, it can not act as a section 103 reference in obviousness analyses. Therefore, Applicants respectfully request withdrawal of the rejections.

Assuming for argument that Yan were a valid reference for obviousness allegations, the cited combination of references would still fail for failing to teach all limitations, lack of motivation and no expectation of success. These arguments are similar to those above with regard to Yan and Luczak alone and in other combinations. Harris teaches preparation of pure metal catalytic surfaces on silicon wafers for use in fuel cells. Harris does not teach fiber substrates, nanotube catalysis, or any type of nanoparticle. Harris does not provide additional disclosures that can cure the failures cited above.

**Allowable Matter.**

Applicants appreciate that the Examiner finds claims 109-111 to contain novel and non-obvious ternary catalysts. However, Applicants decline to rewrite the claims in dependent form because they are dependent on non-obvious claims, as discussed above.


**CONCLUSION**

In view of the foregoing, Applicants believes all claims now pending in this application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the claims are deemed not to be in condition for allowance after consideration of this Response, a telephone interview with the Examiner is hereby requested. Please telephone the undersigned at (510) 337-7871 to schedule an interview.

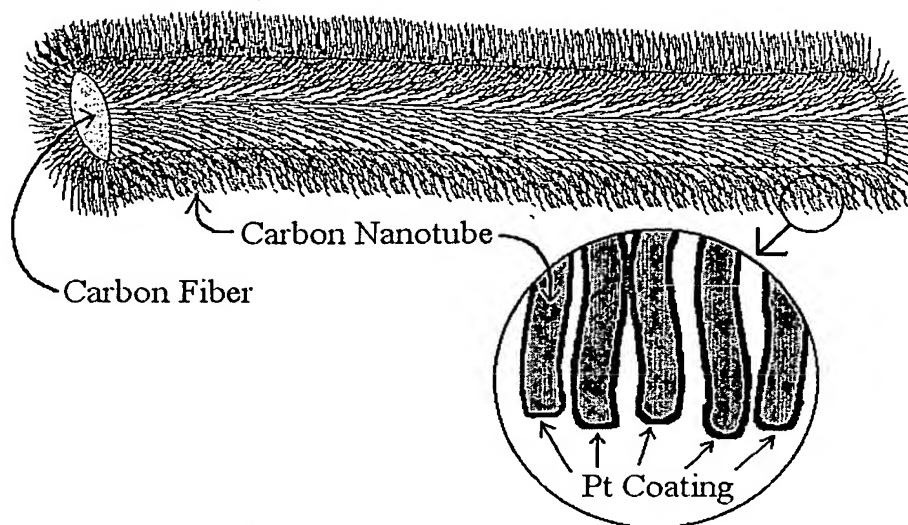
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Respectfully submitted,

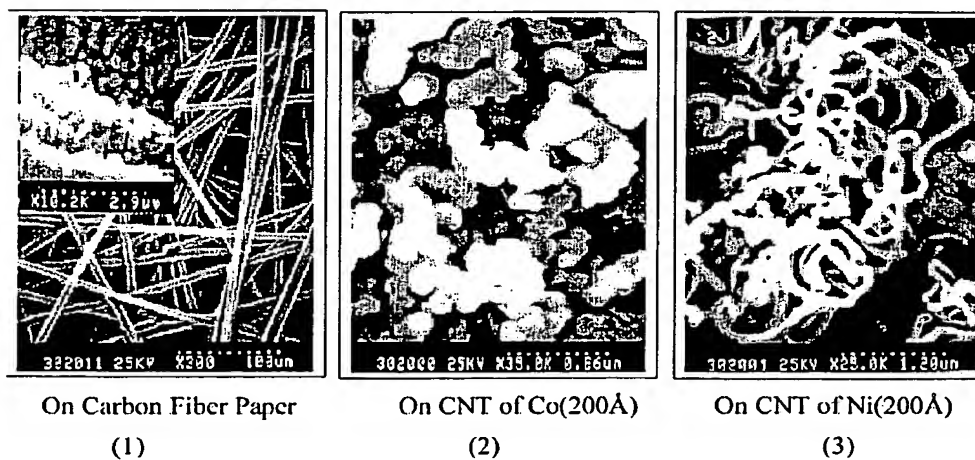
  
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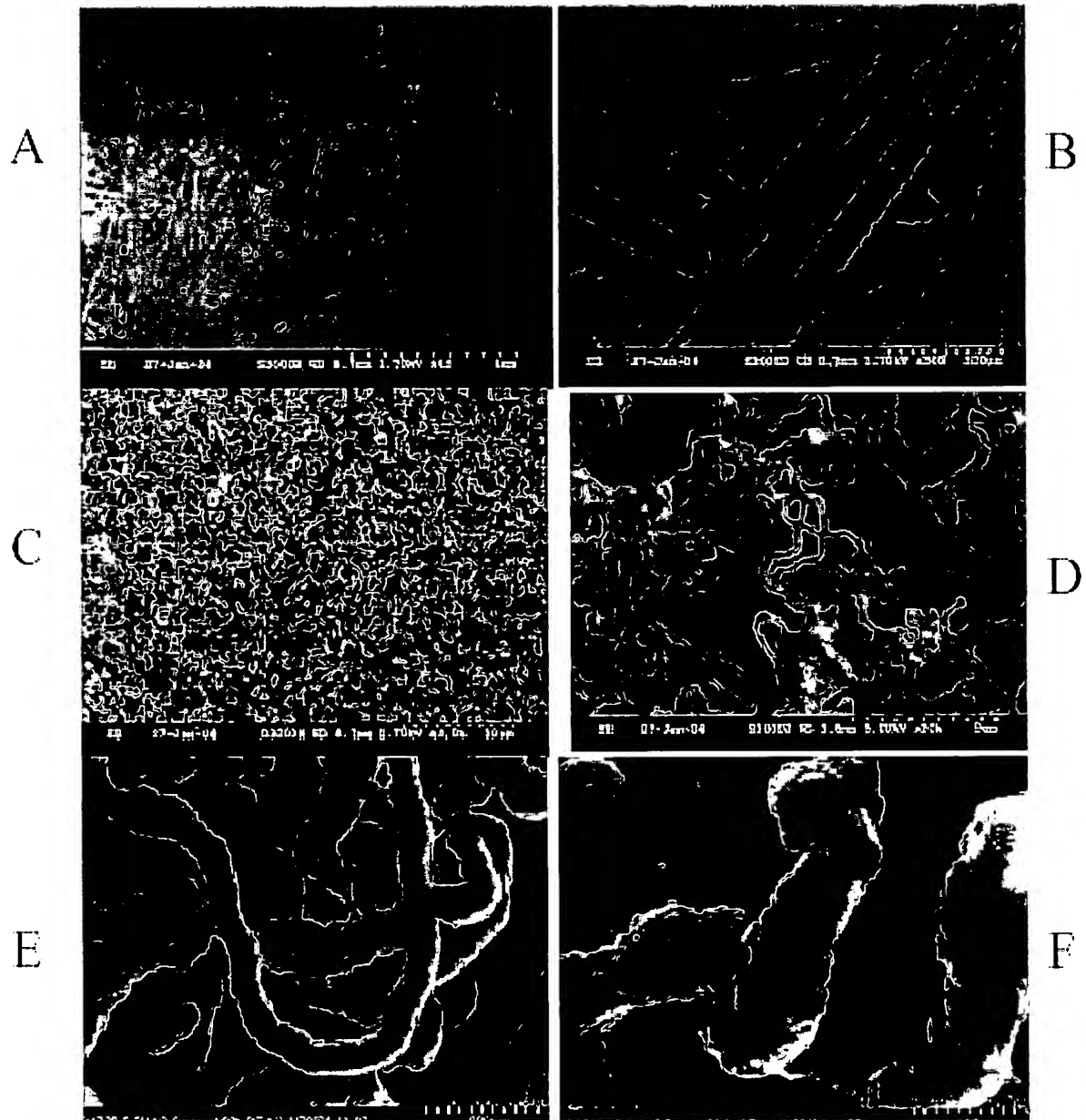
**Fig. 10**



**Fig. 11**

NOTE : REPLACEMENT SHEET IS PRINTED  
in LETTER PAPER ON HIGHER QUALITY  
PRINTER

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**Fig. 13**

NOTE: ALL ELECTRON MICROGRAPHS REPLACED  
WITH LARGER & MORE RESOLVED COPIES.  
A-F LETTERING REARRANGED